

IN THE CLAIMS:

1. (Previously Presented) A microwave plasma processing apparatus comprising:
a wavelength reducing member constructed and arranged to reduce a wavelength of a microwave transmitted therethrough;
a slot electrode guiding the microwave exiting the wavelength reducing member, the slot electrode provided adjacent to the wavelength reducing member;
a first temperature control device constructed and arranged to control a temperature of at least one of the slot electrode and component parts including the wavelength reducing member provided in the vicinity of the slot electrode within a predetermined range of temperatures by heating at least one of the slot electrode and component parts including the wavelength reducing member above a lower temperature limit and cooling at least one of the slot electrode and component parts including the wavelength reducing member below a higher temperature limit; and
a process chamber into which the microwave exiting the slot electrode is introduced so that a plasma is generated by the microwave within the process chamber.
2. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 1,
wherein the first temperature control device controls the temperature of the slot electrode to be in a predetermined temperature range so as to substantially eliminate influence of water released from components in the process chamber on a substrate being processed.
3. (Original) The microwave plasma processing apparatus as claimed in claim 2,
wherein the predetermined temperature range is $70 \pm 10^{\circ}\text{C}$.
4. (Original) The microwave plasma processing apparatus as claimed in claim 1,
wherein the first temperature control device controls the temperature of the wavelength reducing member so as to control the temperature of the slot electrode by utilizing transmission of heat between the wavelength reducing member and the slot electrode.

5. (Original) The microwave plasma processing apparatus as claimed in claim 1, further comprising an antenna accommodating member accommodating the wavelength reducing member, wherein the first temperature control device controls a temperature of the antenna accommodating member so as to control the temperature of each of the wavelength reducing member and the slot electrode by utilizing transmission of heat between the antenna accommodating member and each of the wavelength reducing member and the slot electrode.
6. (Original) The microwave plasma processing apparatus as claimed in claim 1, further comprising a dielectric material member interposed between the slot electrode and the process chamber, wherein the first temperature control device controls the temperature of one of the wavelength reducing member and the dielectric material member so as to control the temperature of the slot electrode by utilizing transmission of heat between the slot electrode and the one of the wavelength reducing member and the dielectric material member.
7. (Original) The microwave plasma processing apparatus as claimed in claim 1, further comprising a second temperature control device controlling a temperature of an object to be processed within the process chamber.
8. (Original) The microwave plasma processing apparatus as claimed in claim 6, further comprising a third temperature control device controlling a temperature of a periphery of the dielectric material member.
9. (Original) The microwave plasma processing apparatus as claimed in claim 1, wherein the first temperature control device includes a temperature control arrangement for controlling a temperature of a side wall of the process chamber.
10. (Withdrawn) A plasma processing method comprising the steps of:
 - placing an object to be processed in a process chamber;
 - controlling a pressure inside the process chamber;
 - controlling a temperature of a slot electrode radiating a microwave toward the process chamber by utilizing transmission of heat between the slot electrode and other component parts surrounding the slot electrode;
 - introducing a reaction gas into the process chamber;
 - supplying a microwave to the slot electrode; and

processing the object by plasma generated by the reaction gas and the microwave introduces into the process chamber.

11. (Withdrawn) The plasma processing chamber as claimed in claim 10, wherein the step of controlling a temperature includes the step of:

controlling a temperature of a wavelength reducing member so as to control the temperature of the slot electrode by utilizing transmission of heat between the wavelength reducing member and the slot electrode, the wavelength reducing member reducing a wavelength of the microwave supplied to the slot electrode;

12. (Withdrawn) The plasma processing process as claimed in claim 10, wherein the step of controlling a temperature includes the step of:

controlling a temperature of a dielectric material member provided between the slot electrode and the process chamber so as to control the temperature of the slot electrode by utilizing transmission of heat between the dielectric material member and the slot electrode.

13. (Withdrawn) The plasma processing process as claimed in claim 10, further including the step of controlling a temperature of an object to be processed within the process chamber.

14. (Withdrawn) A plasma processing method comprising:

placing an object to be processed in a process chamber;

controlling a pressure inside the process chamber;

controlling a temperature of a slot electrode radiating a microwave toward the process chamber;

introducing a reaction gas into the process chamber;

supplying a microwave to the slot electrode when a temperature of the slot electrode is below a predetermined temperature; and

processing the object by plasma generated by the reaction gas and the microwave introduced into the process chamber.

15. (Withdrawn) The plasma processing process as claimed in claim 14, wherein the step of controlling a temperature includes the step of:

controlling a temperature of a wavelength reducing member so as to control the temperature of the slot electrode by utilizing transmission of heat between the wavelength

reducing member and the slot electrode, the wavelength reducing member reducing a wavelength of the microwave supplied to the slot electrode;

16. (Withdrawn) The plasma processing process as claimed in claim 14, wherein the step of controlling a temperature includes the step of:

controlling a temperature of a dielectric material member provided between the slot electrode and the process chamber so as to control the temperature of the slot electrode by utilizing transmission of heat between the dielectric material member and the slot electrode.

17. (Withdrawn) The plasma processing process as claimed in claim 14, further including the step of controlling a temperature of an object to be processed within the process chamber.

18. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 1,

wherein the first temperature control device comprises:

a control unit;

a temperature sensor; and

a heater.

19. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 18,

wherein the temperature sensor includes at least one of a platinum resistor, a thermistor, an infrared temperature sensor, and a thermocouple.

20. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 18,

wherein the temperature sensor is configured to sense a temperature of at least one of the wavelength reducing member and the slot electrode.

21. (Previously Presented) A microwave plasma processing apparatus comprising:

a wavelength reducing member constructed and arranged to reduce a wavelength of a microwave transmitted therethrough;

a slot electrode guiding the microwave exiting the wavelength reducing member, the slot electrode provided adjacent to the wavelength reducing member;

a process chamber into which the microwave exiting the slot electrode is introduced so that a plasma is generated by the microwave within the process chamber;

a first temperature control device comprising:

a control unit;

a temperature sensor; and

a heater comprising a heating wire wound on a fluid supply tube connected to a fluid passage in a temperature control plate to supply a fluid to the temperature control plate;

said first temperature control device being configured to control a temperature of at least one of the slot electrode and component parts including the wavelength reducing member provided in the vicinity of the slot electrode within a predetermined range of temperatures by heating at least one of the slot electrode and component parts including the wavelength reducing member above a lower temperature limit and cooling at least one of the slot electrode and component parts including the wavelength reducing member below a higher temperature limit.

22. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 18,

wherein the control unit controls an electric current supplied to the heater based on temperature information output from the temperature sensor.

23. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 1,

wherein the first temperature control device includes a stop valve and a mass flow controller configured and arranged to control an amount of fluid.

24. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 23,

wherein the first temperature control device operates the mass flow controller and the stop valve so as to supply the fluid from a fluid source to a temperature control plate.

25. (Previously Presented) The microwave plasma processing apparatus as claimed in claim 24,

wherein the first temperature control device simultaneously controls both the temperature of the wavelength reducing member and the temperature of the slot electrode by controlling an amount of fluid flowing through the temperature control plate.

26. (Previously Presented) A microwave plasma processing apparatus comprising:

a wavelength reducing member constructed and arranged to reduce a wavelength of a microwave transmitted therethrough;

a slot electrode guiding the microwave exiting the wavelength reducing member, the slot electrode provided adjacent to the wavelength reducing member;

a process chamber into which the microwave exiting the slot electrode is introduced so that a plasma is generated by the microwave within the process chamber;

a first temperature control device comprising a fluid supply tube connected to a fluid passage in a temperature control plate and a heating wire wound on the fluid supply tube,

wherein said first temperature control device is configured to heat at least one of the slot electrode and component parts including the wavelength reducing member above a lower temperature limit and to cool at least one of the slot electrode and component parts including the wavelength reducing member below a higher temperature limit.